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ABSTRACT

The usefulness of taking notes to enhance recall was assessed, based on reviewing the research literature using the techniques of meta-analysis. Meta-analysis allows for both the computation of the strength of an effect within studies and the determination of mean effect sizes averaged across related studies. Fourteen studies that maintained notetaking versus non-notetaking (listening) group comparisons were examined, along with seven studies that included a group that took notes and mentally reviewed notes and another group that took no notes but reviewed the lecturer's full notes. Specifically, the following research questions were addressed: whether the process of taking notes in itself aids recall; and whether reviewing one's notes aids recall. Results indicated that the process of taking notes in itself does little to enhance recall performance (encoding hypothesis), but that permitting students to review their own notes (external storage hypothesis) clearly results in superior recall achievement. The control group for nearly half the studies had access to the lecturer's full notes. While the control group had 100 percent of the possible test information available to them, the notetaking groups almost surely had less information at their disposal. Problems with meta-analysis are identified. References and a master list of Georgia State University reading and learning assistance technical reports are appended. (SW)

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College Reading and Learning Assistance

Technical Report 85-05

A Meta-Analysis of the Effect of Notetaking on Learning from Lecture

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A Meta-analysis of the Effect of Notetaking On Learning From Lecture

Notetaking is an instrumental learning ctrategy employed by a clear majority of students functioning in college and university lecture settings. Its widespread usage suggests that students must view the notetaking process as one which facilitates their assimilation and retention of important conceptual understandings. The purpose of this study was to determine if the research literature on notetaking supports students' intuition about its value when the techniques of meta-analysis are applied to existing data.

Encoding and External Storage

According to Hartley and Davies (1978), students report making lecture notes for two primary reasons. From a process standpoint, students believe that the act of writing things down in their own words somehow aids recall. This is what Divesta and Gray (1972) refer to as the Encoding Hypothesis.

The encoding hypothesis presupposes that the mental operations involved in attending to the auditory stimuli of the lecture and transforming the data into a written code deepens the level of processing and thereby increases the probability that the information can be recalled.

The second major reason why students report taking notes is to generate a product which permits later studying of the material. Students' notes provide a rather permanent record of class events which allows for later revision, organization, and a general reconstruction of the lecture. This function of notetaking is known as the External Storage Hypothesis. While surely less compelling psychologically, the external storage hypothesis suggests that the practical strategy of reviewing one's notes ultimately results in greater degrees of learning.

Why Meta-analysis?

Increasingly, research examining the merits of these two notetaking hypotheses has yielded equivocal results (Stahl, Henk, & King, 1984). For instance, Hartley and Davies (1978) identified 17 studies which indicated that the act of notetaking alone without the benefit of review (the encoding hypothesis) resulted in significantly better achievement. By contrast, they found 16 studies indicating no significant effect as well as 2 others which actually suggested that notetaking resulted in significantly poorer performance than simply listening to a lecture. Taken as a whole, these findings do little to clarify the nature of the effect that encoding has on recall performance.

A less confusing trend emerges for the external storage hypothesis. Hartley and Davies (1978) found thirteen studies which indicated significant effects when students were allowed to review their own notes (as compared to mental

review only groups or groups reviewing the lecturer's full notes). Only three studies failed to yield a significant effect for reviewing notes and no study demonstrated that the reviewing process resulted in markedly poorer performance than a no review condition.

As Glass (1976, 1977) suggests there are a number of problems associated with merely tallying studies according to whether or not they yielded significant effects. This technique, known as the voting method, may be biased in favor of large sample studies. Because of the greater sample size, significant effects are more easily achieved than when small samples are used. This tendency presents a problem for the voting method when large sample studies yield significant albeit weak findings. The voting method does not indicate the magnitude of the effect of the independent variables. As a result, studies of marginal significance are weighted precisely the same as other studies whose effects are a good deal more robust.

Meta-analytic techniques, on the other hand, allow for both the computation of the strength of an effect within studies and for the determination of mean effect sizes averaged across related studies. For this reason, a meta-analytic research paradigm was used in the present analysis to shed additional light on the research regarding the encoding and external storage hypotheses of notetaking. Specifically, the following two research questions were addressed:

1. Does the process of taking notes in itself aid recall?
2. Does reviewing one's notes aid recall?

Both questions were evaluated using methods described in Glass, McGraw, and Smith (1981).

METHOD

Literature Search and Results

To identify the relevant literature on notetaking, several search procedures were undertaken. First, it was necessary to locate key summary articles such as those provided by Carrier (1983), Carrier and Titus (1979), Hartley and Davies (1978), Norton (1981), Rickards (1979), and Weener (1974). Citations included in these articles provided a basis for tracing relevant studies dating back through the 1920's. In addition, the list of studies noted by Hartley and Davies was updated and extended through examining volumes of Current Index to Journals in Education (CIJE) and by accessing various computer data bases including ERIC and Psychological Abstracts.

For the encoding hypothesis analysis, studies were included in the meta-analysis which maintained a notetaking versus non-notetaking (listening) group comparison. Any study which allowed formal review provisions was excluded from the meta-analysis for this question. The literature search produced 31 studies meeting these qualifications. Only 21 of these studies were retrieved despite extensive search efforts. Of these 21 studies, only 14 provided sufficient data to allow for the recovery of effect sizes. A total of 25 dependent measurements were made within these 14 studies. The average effect size across these 25 dependent variables measured .34 with a standard deviation of .646. What the .34 aggregate effect size suggests is that notetaking can be expected to move the recall performance of an average individual in the control group roughly 1/3 of one standard deviation above the group mean. This represents a move from the 50th to the 62nd percentile. On the whole, the average effect size for the encoding hypothesis can be considered modest, indicating that the act of notetaking itself does only a limited amount to aid students' recall

of the information presented in a lecture.

To answer the external storage research question, studies were included in the analysis which maintained a take notes/review own notes treatment condition and either (1) a take notes/mental review only or (2) a take no notes/review lecturer's full notes control conditions. The initial search for studies concerned with the external storage hypothesis yielded 18 possible data sources. Fourteen of these pieces were located; however, only 7 of the studies provided enough statistical information to permit the computation of effect sizes. The seven studies included 11 dependent measures and the average effect size for these observations measured 1.56 with a standard deviation of 1.40. The effect size estimate suggests that average subjects in the control group could be expected to move 1 1/2 standard deviations above the mean when allowed to review their own notes. This would place them in the 92nd percentile of the untreated group. Since treatment seemed to increase subjects' performance so dramatically, the effect size for the external storage hypothesis may be regarded as both large and significant. That is to say, the process of reviewing one's notes decidedly facilitates recall of lecture information.

DISCUSSION

Based on the results of the meta-analysis, it appears that the process of taking notes in itself does little to enhance recall performance (encoding hypothesis), but that permitting students to review their own notes (external storage hypothesis) clearly results in superior recall achievement. In this regard, the meta-analysis confirms and extends the results of the voting method analyses of Hartley and Davies (1978) while circumventing limitations inherent in their tallying approach. Before these current findings are

accepted, however, a number of important qualifications seem to be in order.

First, the meta-analytic method is not without its own set of limitations. For instance, oftentimes the treatment and control groups are either (1) not pure, (2) not precisely comparable across studies, or (3) embedded in complicated multi-factor designs which render effect size estimates tentative at best. Conditions and contexts existed within several studies which made their treatments and controls quite unlike those operationally defined in other related experiments.

Another problem with meta-analysis is that certain studies can exert a disproportionate effect on the effect size mean. This is because each dependent measure yields an effect size which is included in the computation of the mean for the overall effect. Consequently, studies examining several dependent measures simultaneously influence distributions to a greater extent than less "ambitious" research efforts. Assuming that a multiple dependent measure study is a good one, its influence is desirable. However, if it happens to be one of the less internally valid studies, the effect size estimate may be unduly influenced by questionable research methodologies. The mean effect size estimate is also made suspect by still one other aspect of the meta-analysis. Since many studies do not provide sufficient statistical data to recover the effect sizes, the mean is often based on only a limited proportion of the total number of studies examining the research question. Perhaps the studies from which effect sizes can be retrieved paint a very different picture from what might occur when all pertinent studies are considered.

Assuming that the meta-analysis is reasonably accurate, one still must be careful not to reject the encoding hypothesis prematurely. As Peper and

Mayer (1978) point out, perhaps the reasons that the encoding hypothesis has fared so poorly overall is that researchers have tended to look at how much is retained rather than what is retained. This quantity versus quality issue was borne out in Peper and Mayer's own experiment as notetakers tended to recall higher level propositions while a non-notetaking group tended to recall more lower level concepts.

Overall, the external storage hypothesis received strong support by virtue of the meta-analysis. On the surface, the finding that reviewing one's notes aids recall may not seem particularly profound or surprising. The finding takes on added meaning when the fact that the control group for nearly half of the studies had access to the lecturer's full notes. In other words, the control group had one hundred percent of the possible test information available to them. The notetaking groups almost surely had less information at their disposal. Research indicates, for example, that students are only able to correctly record about 53 percent of the important information presented in a lecture (Crawford, 1925). Apparently, notetakers are either recalling a substantial proportion of the points on which they took notes or they are able to reconstruct the lecture content by using recorded points as retrieval cues when studying. It is even possible that the encoding process which necessarily preceded reviewing one's own notes may have contributed to the notetaker/review condition's advantage. Since encoding and external storage functions are irrevocably bound to one another in naturalistic lecture-study contexts, such a conclusion is not wholly unreasonable. It remains for future research to address this notion as well as a multitude of additional factors which bear directly on the critical skill of student notetaking behavior.

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